REMARKS/ARGUMENTS

Claims 12-19 and 21-23 are present in this application. By this Amendment, claim 23 has been added. Reconsideration in view of the above amendments and the following remarks is respectfully requested.

Claims 12, 21 and 22 were rejected under 35 U.S.C. §103(a) over U.S. Patent No. 4,847,184 to Taniguchi et al. in view of U.S. Patent No. 6,489,985 to Brodsky et al. and U.S. Patent No. 5,190,791 to Gunter et al. This rejection is respectfully traversed.

As pointed out by the Examiner, Brodsky essentially discloses a laser marking system wherein the modulated output is accomplished by merely modulating the pump source (col. 6, lines 33-67). In Brodsky, it is disclosed that "[a] feature of the fiber marking laser system of this invention is its reliability to maintain the intensity level of optical marking output by means of its feedback for controlling the current level operation of the laser diode pump source. Thus, if there is a detection in the intensity of the marking output, the feedback control provides for increase of the current to the driver circuit for the pump laser source to increase the marking output of the marking laser to its original intensity level" (col. 4, lines 25-35). From this disclosure, it is understood that, albeit the intensity of the output can be changed by modulating the pump source, during a single continuous marking process, the intensity of the optical marking output is substantially constant, resulting in an energy per surface unit substantially constant so that no "shades of grey" can be obtained on a wooden object to be marked. As consequence of this, the laser is not really a laser scanner in the sense of the present application, that is to say a device that is able to completely reproduce an image, but rather it is able to mark a surface by tracking lines having identical color intensity during a single marking process.

Additionally, Brodsky does not teach to adjust the emission of the laser beam by directly varying the pumping of the active material during marking in order to obtain shades of gray.

Gunter refers to a wood laser-processing technique very different from the technique disclosed the present application. In fact, Gunter discloses a process for enhancing the contrast of the surface grain of a veneer sheet by applying a de-focused and diverging laser beam with high spot diameter (up to 11cm – see col. 3, lines 40-44 of Gunter) and providing one and the same heat specific energy quantity to the whole surface area of the veneer sheet. No modulation of the laser beam in order to achieve point to point variations of the heat specific energy quantity on the processing area is envisaged, as well as no focused laser beam – which is significant in order to transfer images to the wood – is provided in Gunter. Hence, no focused beam and no precise modulation of the laser beam are needed (nor they are suggested) in Gunter.

With regard to Taniguchi, Applicants note that Taniguchi it is silent about the use of a modulator placed intra-cavity (and/or direct pumping control), and it is silent about the heat specific energy quantity provided on the processing wood surface, since the use of an acousto-optical modulator for varying the heat specific energy quantity does not allow for a precise control of such a quantity, nor does it allow the heat specific energy quantity to be easily modulated in order to obtain shades of gray on the wood surface (for example, see col. 4, lines 56-59 of Taniguchi, in which it is said that four gradations are applied only).

The claimed invention aims at transferring wood grain images (usually in shades of grey) onto wooden supports in order to obtain a very "natural" result (see pages 16-17 of the application). Such a task is not addressed by the cited prior art. Applicants discovered that such an aim can be achieved by:

precisely transferring shades of gray of the grain image to the wooden support by means of heat specific energy quantities transferred by a focused laser beam onto the wooden support; and

obtaining a certain penetration depth of the laser beam within the wooden support.

Accordingly, Applicants discovered that:

in order to precisely transfer shades of grey to the wooden support by means of a laser beam, traditional acousto-optical modulators were not suitable, while intra-cavity modulators (or a direct pumping) only were proper. Such a fine regulation of the energy quantity emitted by the (focused) laser beam is desirable to precisely transfer images with multiple grey gradations to the wooden support, as well as to obtain a proper heat energy with high penetration depths; and

a specific "energy per surface unit" range (i.e. from 0 j/cm2 to 43,8 j/cm2), that is desirable in order to get a high and specific penetration depth (i.e. from 0,1 mm to 1 mm) of the laser beam, should be used in order to obtain the desired "natural" result when the reproduction of a grain image onto a wooden support is carried out.

In view of this, it is clear that Taniguchi differs from claim 1 in that Taniguchi lacks at least one adjustment unit that adjusts the emission of the laser beam by directly varying the pumping of the active material and/or by varying the operation of a modulator placed within the resonant cavity of the at least one source of a laser beam, and that the laser beam energy irradiating a locally portion of the wooden support ranges between 0 j/cm^2 and 43,7 j/cm^2.

The technical effect of this difference is that the emission power of the laser beam can be effectively controlled and that it is possible to obtain, by a reduced evaporation of the water molecules contained in the surface layer of the wooden material, color changes to black in the

wooden material down to a depth that can reach several tenths of millimetres (see paragraph [0086] in the published application).

An objective technical problem addressed by the claimed invention is to enhance the quality of the images that are printed on a wooden support by a laser beam, obtaining a very natural result on the treated wooden support (see paragraph [0088] in the published application). This problem is solved by the claimed invention, which provides for a laser-printing transferring of an image on a wooden support wherein an adjustment unit adjusts the emission of the laser beam by directly varying the pumping of the active material and/or by varying the operation of a modulator placed within the resonant cavity of the at least one source of a laser beam, and wherein the support is locally subjected to irradiation by means of the laser beam with an energy per surface unit ranging from 0 j/cm^2 to 43,7 j/cm^2, in order to blacken the surface portion of the support being subjected to the local irradiation. Applicants have ascertained that in order to transfer images to a wooden support, the emission of power should be effectively controlled and that the support should be subjected to an energy per surface unit value ranging between 0 j/cm^2 to 43,7 j/cm^2 to the purpose of obtaining color changes to black in the wooden material down to a depth that can reach several tenths of millimetres (page 5, paragraph [0086]). Such a surprising effect achieved by the claimed range of energy per surface unit would not be expected by the laser-printing method of prior art documents in which the range of energy per surface unit irradiating the wooden support was not even considered.

Regarding Taniguchi, the skilled person confronted with above problem would look at ways for solving the technical problem without having any indication or hint to change the range of the laser beam energy irradiating the wooden support of the apparatus disclosed in Taniguchi.

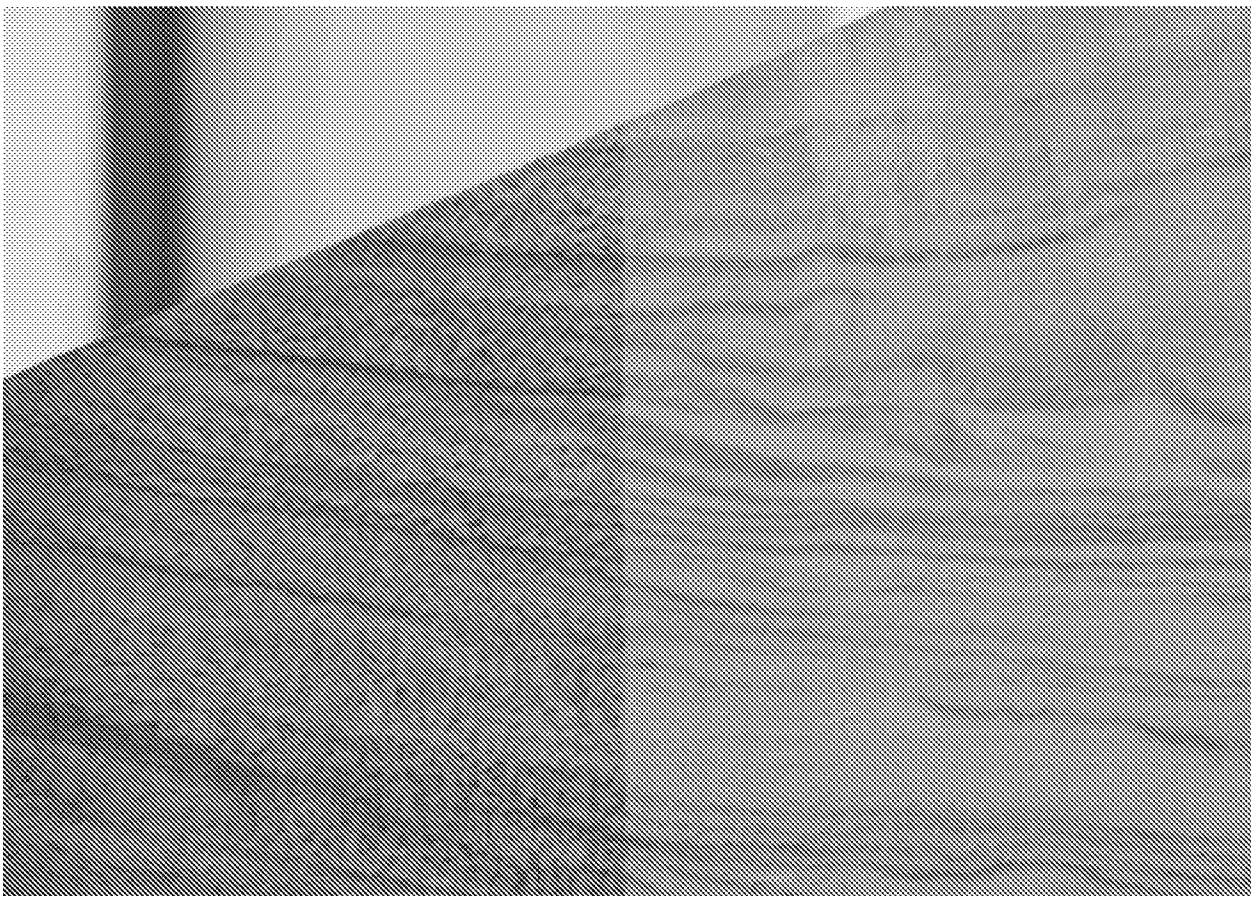
Indeed, in Taniguchi, the energy per surface unit range is not considered a relevant parameter for performing the laser printing method disclosed herein.

Furthermore, Applicants submit that those of ordinary skill in the art would not combine Taniguchi with Brodsky since Brodsky similarly does not address the above mentioned problem and does not give any hint or suggestion to use a laser beam on a wooden surface for transferring images on a surface, but just for transferring lines having the same color intensity during the marking process. In this context, as noted above, the laser system disclosed in Brodsky is not really a laser scanner in the sense of the claimed invention; that is to say a device that is able to completely reproduce an image, but it is able to mark a surface by tracking lines having identical color intensity during the marking process. Therefore, those of ordinary skill in the art confronted with above objective technical problem would not look to Brodsky to modify Taniguchi.

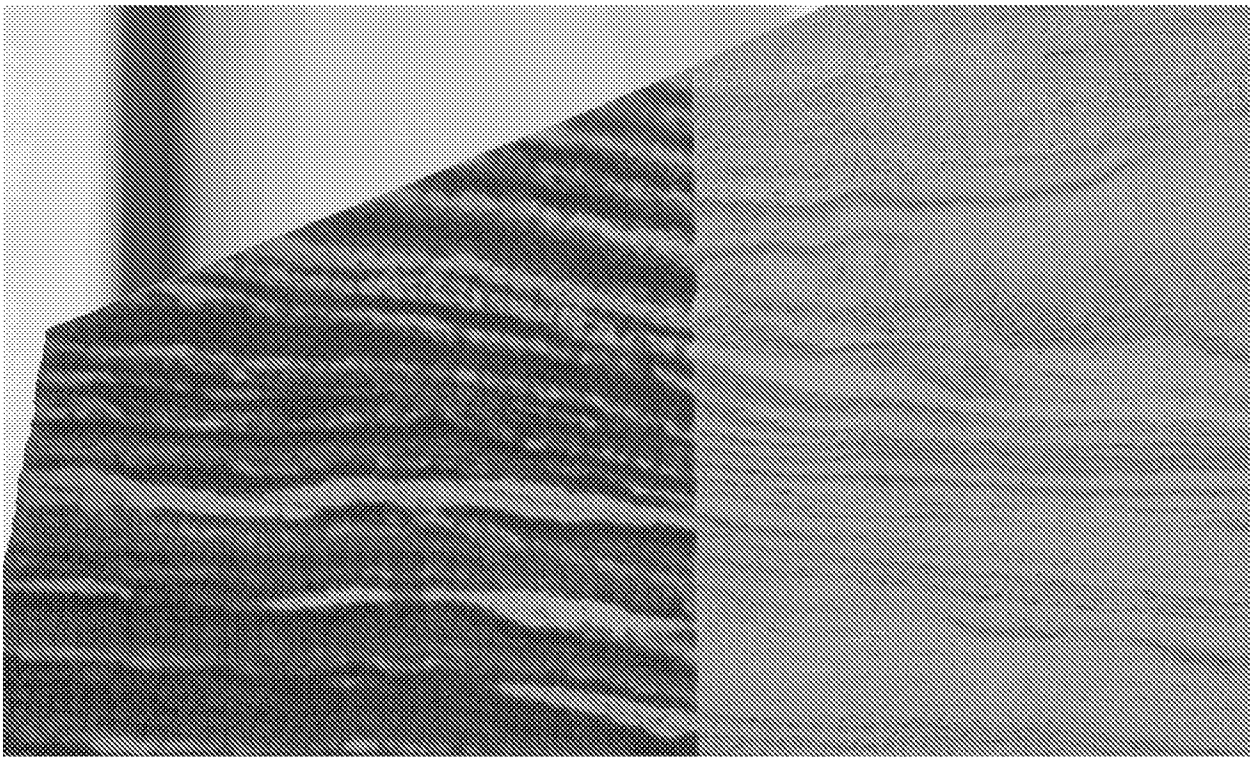
Moreover, even if Taniguchi and Brodsky were combined, the claimed invention would not result because the laser device disclosed in Brodsky does not work in the same range as the laser scanning device of the claimed invention; that is to say from 0 j/cm2 to 43,7 j/cm2. Additionally, the Taniguchi and Brodsky combination falls short of the claimed invention because in Brodsky, the modulation of the pumping source along with the feedback system for controlling the current level operation of the laser diode pump source and so the intensity of the optical marking output do not allow to obtain shades of gray in a wooden material.

Gunter similarly lacks a teaching or suggestion of such an energy range in order to reproduce images (and thus modulating such a heat energy with a focused laser beam). Rather, Gunter teaches to process the veneer surface with a de-focused laser beam having a constant heat energy during the whole operation, without any modulation in the laser beam irradiation.

Applicants note that, in contrast with Gunter, which provides for a very low permanence time of the laser beam onto the wooden support (e.g., see col. 3, line 60 or claim 10 of Gunter), the claimed invention utilizes a permanence time of the laser beam that is well longer in order to get such a high penetration depth of the laser beam. For the Examiner's convenience, the following image relates to the application of the method described in Gunter:



In contrast, the following image refers (left side) to the claimed method of the present application:



The differences are self evident.

The accurate regulation of the laser operational parameters is desirable in order to get a precise reproduction of wood grain images onto a wooden support, wherein the emission of the laser beam is adjusted by directly varying the pumping of the active material and/or by varying the operation of a modulator placed within the resonant cavity of the source of the laser beam, and wherein the wooden support is locally subjected to irradiation with an energy per surface unit ranging from 0 j/cm2 to 43,7 j/cm2 and the instructions for adjusting the emission, movement, and focusing of the laser beam relative to the support allow the laser beam to penetrate within the support by a thickness ranging from 0,1 and 1 mm.

Thus, the claimed solution is not disclosed, nor suggested, by cited prior art documents, taken alone or in mutual combination one with another.

For at least these reasons, Applicants submit that the rejection of independent claim 12 is misplaced.

With regard to the dependent claims, Applicants submit that these claims are allowable at least by virtue of their dependency on an allowable independent claim.

Reconsideration and withdrawal of the rejection are respectfully requested.

Claims 13 and 15 were rejected under 35 U.S.C. §103(a) over Taniguchi in view of Brodsky, Gunter and U.S. Published Patent Application No. 2005/0006357 to Connor. Additionally, claim 14 was rejected over Taniguchi in view of Brodsky, Gunter, Connor and U.S. Published Patent Application No. 2002/0113829 to Nims et al., and claims 16 and 17 were rejected over Taniguchi in view of Brodsky, Gunter and U.S. Published Patent Application No. 2005/0083551 to McIlvaine. Still further, claim 18 was rejected over Taniguchi in view of Brodsky, Gunter and U.S. Patent No. 4,315,379 to Lang, and claim 19 was rejected over Taniguchi in view of Brodsky, Gunter and Japanese Patent Publication 2001-205463 to Nosaka et al. Without conceding these rejections, Applicants submit that these additional secondary references do not correct the deficiencies noted above with regard to Taniguchi, Brodsky and Gunter. As such, Applicants submit that these dependent claims are allowable at least by virtue of their dependency on an allowable independent claim. Withdrawal of the rejections is requested.

Claim 23 has been added. Claim 23 includes features of the method similar to those discussed above with regard to claim 12. As such, Applicants submit that claim 23 is allowable for similar reasons. Claim 23 defines additional detail of the transferring method that are also

lacking in the references of record. Support for this subject matter can be found in the specification at, for example, page 14, line 8 - page 15, line 17.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the claims are patentable over the art of record and that the application is in condition for allowance. Should the Examiner believe that anything further is desirable in order to place the application in condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Prompt passage to issuance is earnestly solicited.

The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to Deposit Account No. 14-1140.

Respectfully submitted,

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